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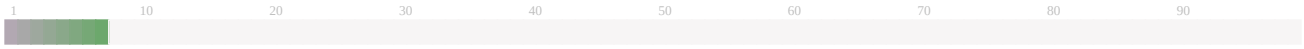

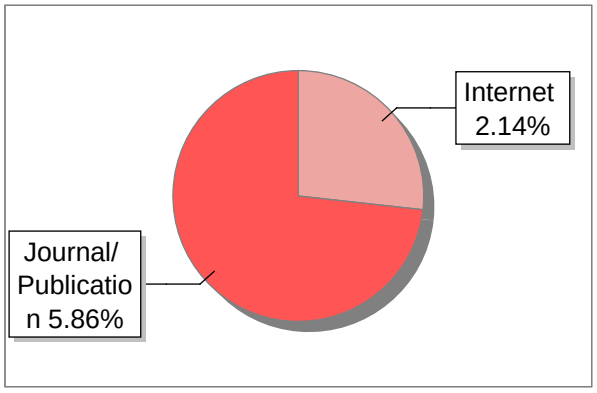

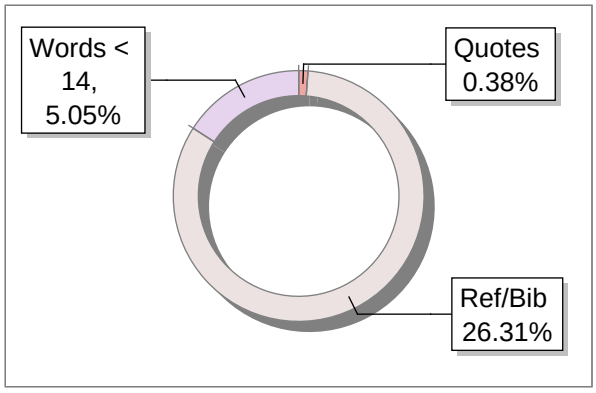

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DEVELOPMENT OF PROTOCOL FOR FROZEN SHOULDER PAIN MANAGEMENT USING DIFFERENT DEVICES

A SYNOPSIS

Submitted for the Registration for the Degree

of

Doctor of Philosophy

in the

PHYSIOTHERAPY
Faculty of Physiotherapy and Allied Health Science
by

Anil Kaushik

(Regn. No: SVSU/Ph.D./ 45507)
Enrollment No.:- 2203000002604

Under the Supervision of

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Swami Vivekanand Subharti University
(NAAC Accredited grade "A" University)
Subhartipuram, NH-58, MEERUT-25005 (Year 2022-23)

1. Introduction

In the community, a common cause of disability is shoulder problems, and the chronic condition dramatically impacts the ability to perform activities (1). The surrounding structures around the shoulder complex should be assessed thoroughly to find the impairments in musculotendinous structures and capsule-ligamentous complex in patients with shoulder mobility deficits and pain (2). The dynamic and static constraints are created by the rotator cuff tendons and capsule-ligamentous complex in the glenohumeral joint (3). In primary care, glenohumeral joint disorders, acromioclavicular joint disorders, and rotator cuff disorders have been reported as the most common cause of shoulder pain (4). The recurrence rate is 25% in individuals reporting previous episodes of shoulder pain, and persisting pain rates are 40% to 50 % (5). Shoulder mobility deficits and strength affect shoulder function and compromise activity (6).

Although the prevalence of shoulder disease rises linearly with age, discomfort falls off around age 65. This may be explained by the association between occupation shoulder pain and physical activity, shown in other contexts. Despite evidence showing that healthy working life expectancy is not increasing at the same rate, several nations are rising their retirement age in response to the aging of the global population. Therefore, the prevalence of shoulder discomfort issues among working adults is anticipated to rise over time. Future epidemiological research must take these aspects into account (7). Functional impairments are frequent and can affect daily activities such as employment, hobbies, socializing, and sports participation. They may also be linked to psychological suffering and a lower quality of life (8).

Range of motion is an essential part of clinical assessment to determine the degree of movements in different directions performed by a person, which helps to know about the Patient's diagnosis, functional limitation, and valuable information (9). In follow-up research studies, range of

motion evaluations is part of outcome assessment (10). The Universal Goniometer is the most widely used tool for ROM assessment in clinics for the hip or shoulder joints (11). They are reliable and valid for static measurements but cannot measure joint angles' dynamic activity (12). Some digital goniometers, visual estimation, digital inclinometer, and some other devices are used to study the ROM, such as the Kinect system and gyroscope (13).

Smartphone applications are an attractive and reproducible alternative method to measure shoulder ROM. They are widely available inexpensively to several smartphone users and accurately measure angles, allowing health care providers to quickly obtain shoulder ROM measurements in their clinical examination (14). In-home care and acute care settings, therapists could use smartphones for goniometric measurements, making it more convenient instead of carrying resources and tools with them all the time (15). Several smartphone applications have been used to measure ROM in shoulder pathologies, such as inclinometer and photographic virtual goniometer, and these applications are reliable and accurate for joint ROM measurements (16).

Smartphone apps must have validity and reliability comparable to or better than the universal goniometer for doctors to be willing to use them in place of the goniometer (at least in some situations). When employed by different raters (inter-rater) or the same rater taking numerous measurements (intra-rater), dependability in psychometrics refers to the consistency of the angle and displacement measures provided by smartphone apps. Validity refers to the degree to which a measurement made using a single device, such as a smartphone app, correlates with or matches a criterion laboratory device, such as a 3-D motion capture system, or a criterion clinical tool, such as a universal goniometer. It also refers to the reliance on various smartphone sensor components, such as a magnetometer vs. a gyroscope, when measuring ROM in various Cardinal

planes. Magnetometers are necessary when evaluating axial rotation in an anti-gravity position (such as sitting). Magnetometers are more susceptible to signal distortion by ambient magnetic fields than gravity-dependent gyroscopes, potentially lowering their validity and dependability (17).

Several studies on shoulder ROM measurement using smartphone applications are available for reliability and validity (18, 19, 20). Shimizu et al. examined the reliability of measuring shoulder ROM using a smartphone application goniometer and reported that the intraclass correlation coefficient was between 0.72 and 0.97, showing an approximately perfect correlation (21). Sahu D et al. reported ICC values between 0.83 and 0.96 for volunteers and between 0.90 and 0.98 for the patients, showing excellent correlation and interobserver reliability was excellent by ICC scores between 0.86 and 0.99 of protractor app for measuring shoulder ROM (12). The use of smartphones for therapeutic purposes is currently quite common. Smartphone applications (apps) have recently made the smartphone a device for healthcare providers. As a result, in recent years, ROM-measuring health applications have gained acceptance; many of these apps use goniometry in the knee or elbow joints (20). Apps with sensors (22, 23, 24) and inclinometers (25, 26) have studied the shoulder's mobility. Recent years have seen an increase in tele rehabilitation research, which leverages communications technology to deliver rehabilitation services remotely (26).

Therefore, our research aimed to formulate a protocol for managing pain associated with frozen shoulder, utilizing various devices. A key aspect of our study also involved assessing this protocol's intra-rater reliability and validity, specifically in its capacity to accurately measure the active range of motion, employing diverse parameters for thorough evaluation.

Significance of the Study:

Our study aimed to develop a protocol for pain management in cases of frozen shoulder by using a range of devices. We were particularly interested in exploring the role of technology in physiotherapy and how smartphones could be used to assess active range of motion (AROM) more effectively.

Traditionally, AROM measurements have been limited by factors such as cost and accessibility. Our study aimed to overcome these limitations by proposing a reliable smartphone application as a practical alternative. This innovation streamlines AROM measurements, minimizes subjectivity, and reduces evaluator-dependent biases.

Our research had two main goals. Firstly, we wanted to contribute to medical literature by exploring the properties of smartphone applications for shoulder AROM assessments, an area that has seen limited research. Secondly, we hoped to empower patients by providing them with an easily accessible tool that allows them to monitor their recovery, make informed decisions, and seek medical help when needed.

Our study was also important in standardizing shoulder mobility evaluations across different clinical environments. By establishing the reliability and utility of a smartphone-based application, we aimed to set a new benchmark in physiotherapeutic assessments.

In summary, our research aimed to revolutionize the way AROM is measured and managed in frozen shoulder cases and enhance patient care quality. Finally, there is an overarching need for standardization in shoulder mobility assessments across diverse clinical settings. This research can pave the way for a new gold standard in physiotherapeutic evaluations by validating the reliability and utility of a smartphone application for this purpose.

2. Review of Literature:

Parati M. et al. (Sensors, 2023) conducted this study using goniometer applications (Dr Goniometer and Angles - Video Goniometer) that measure knee joint ROM during walking through smartphone cameras. The primary aim of the study is to test the inter-rater and intra-rater reliability of the collected measurements as well as their concurrent validity with an electro-goniometer. The secondary aim is to evaluate the usability of the two mobile applications. A total of 22 patients with Parkinson's disease (18 males, age 72± 8 years), 22 post-stroke patients (17 males, age 61±13 years), and as many healthy volunteers (8 males, age 45 ±5 years) underwent knee joint ROM evaluations during walking. Clinicians and inexperienced examiners used the two mobile applications to calculate the ROM, and then rated their perceived usability through the System Usability Scale (SUS). Intraclass correlation coefficients (ICC) and correlation coefficients (corr) were calculated. Both applications showed good reliability (ICC > 0.69) and validity (corr > 0.61), and acceptable usability (SUS > 68). Smartphone-based video goniometers could be used to assess the knee ROM during walking in neurological patients, because of their acceptable degree of reliability, validity and usability (27).

Shimizu et al. (JSES international, 2022) used a smartphone application goniometer, yROM (Healthcare Technologies LLC), is a smartphone application that sets the angle to 0° once the user touches the screen of the smartphone. Shoulder movements: forward flexion, extension, abduction, external rotation with arm at the sides, external and internal rotation at 90 abduction, external and internal rotation at 90 forward flexion were measured in standing position. Each movement was measured thrice by the participants with smartphone application and thrice by 2 observers with goniometer. Nineteen healthy participants were selected. Results showed that Agreement between the smartphone application goniometer and UG ranged between 42% and

100%. The intraclass correlation coefficient values (3, 1) for the agreement between the smartphone application goniometer and UG was between 0.72 and 0.97, showing significant and approximately perfect correlations. Authors concluded that the active shoulder ROM measurements using a smartphone application goniometer in a standing position are as reliable as passive measurements in a supine position, which is currently the standard method (28).

Pottorf O et al. (JSES international, 2022 proposed a study consisted of 83 participants that were recruited on a voluntary basis from an academic institution. An iPhone with the application Clinometer and a standard goniometer (SG) were utilized to obtain goniometric measurements of forearm pronation and supination. The intraclass correlation coefficient (ICC) was used to analyze intra- rater reliability, and the Pearson correlation coefficient was used to analyze concurrent validity. Scatterplots with regression lines were created to visually display the results. Results showed that the smartphone demonstrated strong correlations for both pronation and supination (r¼0.71, P<.001; r¼0.73 P<.001). This study demonstrated overall good-excellent intra rater reliability and good concurrent validity for the smartphone application with a higher test-retest reliability in the measurement of forearm pronation compared to supination. Authors concluded that the reliability and concurrent validity of the smartphone was consistent with the Standard goniometer for assessing forearm pronation and supination (29).

Sahu D et al. (Journal of shoulder and elbow surgery, 2022) conducted a study on 24 healthy individuals and 16 symptomatic shoulder patients with expected range of motion deficits. Shoulder ROM was first examined physically using a goniometer in the clinic and then the protractor extension app over Zoom remote conferencing. Validity of instrument was examined by comparing the goniometer method with the protractor app–based method of the expert shoulder consultant using Bland-Altman analysis. It showed only minor mean differences

between the healthy volunteers and the patients in elevation (2.0 and 5.0respectively), abduction (2.0and 3.0, respectively), external rotation with the elbow adducted (1.9and 0.2, respectively), external rotation with the elbow abducted at 90(0.4and 4 respectively), and internal rotation with elbow abducted at 90(2.3and 1.2, respectively), with limits of agreement that were below the well-established minimal clinically important difference values. The intraclass correlation coefficient (ICC) values varied between 0.83 and 0.96 for the volunteers and between 0.90 and 0.98 for the patients, indicating excellent correlation between these two methods. The interobserver reliability between two examiners for the protractor app–based method as evaluated by ICC scores was excellent; it ranged between 0.86 and 0.98 for the volunteers and between 0.88 and 0.99 for the patients. Authors concluded that a protractor app–based method of measuring shoulder ROM over a telehealth medium is accurate and reliable compared with a clinical goniometer method. This validated method can be used during remote telehealth consultation with significant benefits of saving patients travel and time (30).

Chen et al. (Medicine in Novel Technology and Devices, 2022) conducted a study to investigate the concurrent validity of Mark less motion capture system (MLS) for capturing shoulder kinematics during functional movement by comparing the MLS measures to those of the marker-based motion capture system (MBS). Twenty-five healthy participants were included in this study. Using the Microsoft Kinect sensor as the MLS and Vicon as the MBS, six shoulder functional movements were measured in all three anatomical planes concurrently. The six movements included flexion to max, maximum extension, abduction to 90, internal rotation at 90 abduction, external rotation at 0 abduction, and maximum horizontal adduction. The shoulder joint kinematics was measured with both systems. The MLS showed a good to excellent correlation ($r > 0.75$) with MBS for abduction to 90, maximum external rotation at 0 abduction

and maximum internal rotation at 90 abductions. The results for maximum extension (r ¼ 0.727) and maximum horizontal adduction (r ¼ 0.619) showed a moderate to good correlation. For maximum flexion, a poor correlation was observed (r ¼ 0.479). The validity of the MLS to measure shoulder kinematics would be acceptable. The system demonstrates potential as a measurement tool of joint motions for a function assessment and rehabilitation purpose (31).

Takeda Y. and Furukawa K. (Journal of Physical therapy Science,2022) conducted this study aimed to use objective measurements and a survey questionnaire to evaluate the usability, measurement time, and intra- and inter- rater reliability of a smartphone application type of goniometer to measure hip joint angles. Participants and techniques. On 30-day care centre rehabilitation patients, three examiners (physiotherapists) used handheld and universal goniometers to measure the hip joint's range of motion. The intra-class correlation coefficient was used to determine reliability. To evaluate the usability of the goniometers, the examiners answered a questionnaire. [Results] Although the inter-rater reliability was low, the intra-rater reliability was high. The measurement times obtained with the two instruments were identical. The smartphone goniometer appeared to be simpler to use than the universal goniometer, according to the results of the usability questionnaire. Authors concluded that there was high inter-rater reliability, there was little inter-rater reliability. But when a single evaluator used the same goniometric device for all measurements, both of them produced satisfactory range of motion measurement data (32).

Knapp P.W. et al. (Arthroplasty Today) 2022 conducted a study between October 2019 and March 2020, 53 patients were enrolled in a clinical practice. During the patient visit, three different measurements were made: one by the surgeon, one by the app, and one by the physical therapist. To evaluate the agreement between (1) the surgeon and app and (2) that between the

physical therapist and surgeon, intraclass correlations were computed. When measuring flexion, there was a good correlation between the surgeon or the therapist and the app, but there was a moderate correlation between the two. All comparisons of extension measurement between the app, the surgeon, and the therapist revealed a moderate correlation. According to limits of agreements, the surgeon and application differ by only 10 degrees for extension and 11 degrees for flexion. Body mass index had no impact on accuracy. In conclusion, digital app measurements were comparable toward those made in a clinical setting by a doctor or physical therapist using a manual goniometer measuring and evaluating may be effective for remotely patients' range of motion (33).

3. **Research Question/Problem:**

What is the effectiveness of a newly developed protocol using various devices for the management of pain in patients with frozen shoulder?

How reliable is the physio master smartphone app in measuring active range of motion (AROM) for people with and without shoulder mobility deficits across different evaluators (inter-rater) and repeated assessments by the same evaluator (intra-rater)?

To what extent does the physio master smartphone application accurately measure the active range of motion (AROM) in subjects with and without shoulder mobility deficits compared to established gold standards?

4. **Research Objectives:**

1. To develop a protocol for management of frozen shoulder pain using different devices.
2. To assess the inter-rater reliability of above protocol in quantifying active range of motion (AROM)

3. To evaluate reliability and validity of above protocol using different parameters.

5. Hypothesis:

Null Hypothesis (H_0):

The newly developed protocol utilizing various devices will not significantly improve the management of pain in frozen shoulder patients, and it will not demonstrate significant inter-rater reliability in quantifying active range of motion (AROM) or show reliability and validity when evaluated using different parameters.

Experimental Hypothesis (H1):

The newly developed protocol using various devices will significantly improve the management of pain in patients with frozen shoulder, demonstrate significant inter-rater reliability in quantifying AROM, and exhibit reliability and validity when assessed using various parameters.

6. Methodology

Study Design:

- ✓ The study will adopt a mixed-methods design incorporating qualitative and quantitative approaches. This will allow for comprehensive protocol development and evaluation.
- ✓ Cross sectional for reliability and validity

Place of Study/Setting: The study will be conducted at the physiotherapy outpatient department of [XYZ Hospital/Healthcare Centre].

Protocol Development:

- **Identification of Devices**: Various devices, including manual therapy tools, electrotherapy equipment, and exercise aids, will be identified based on current literature and expert consultations.

- **Drafting Protocol**: A preliminary protocol for managing frozen shoulder pain will be developed. This will involve detailed steps on how to use each device effectively, considering different stages of frozen shoulder.

Expert Review:

- The draft protocol will be reviewed by a panel of experts.

Pilot Testing:

- A small group of patients with diagnosed frozen shoulder will undergo the protocol. Feedback will be obtained from both patients and therapists to refine the protocol.

For reliability and Validity

Sources of Data Collection: Primary data will be obtained using methodical interviews and hands-on assessments. A smartphone application will be used to quantify the active range of motion (AROM) in subjects with and without shoulder mobility deficits to check inter and intra-rater reliability. For the criterion validity, the Universal goniometer will be utilized to measure movements within the shoulder joint.

Sampling Methods: Stratified random sampling will be utilized to ensure a balanced representation of shoulder mobility deficits and without shoulder mobility deficits subjects. After stratification, participants in each stratum (mobility deficits and without mobility deficits) will be randomly allocated to evaluate the shoulder range of motion for quantify the reliability and criterion validity.

Sample Size: Sample size calculation: A minimum of 90 subjects (45 subjects without shoulder pain and 45 subjects with shoulder pain) are required for the minimal significant value of ICC 0.60 ($1-\beta= 0.80$; $\alpha = 0.05$).

Selection Criteria:

Inclusion criteria

1. Age between 20 - 50 years

2. Complaint of shoulder pain from last one month

3. Restricted motion at shoulder joint

4. Ability to walk independently

5. Normal or corrected to normal hearing

6. Normal or corrected to normal vision

Exclusion criteria

1. History of any surgery around shoulder joint

2. Patients who had any other surgeries or suffered from injuries to upper extremity in the 12 months prior to the study

3. Receiving intervention from last one week.

4. Any other cardiovascular or neurological disorders

5. Any cognitive impairment

6. Vestibular or neuromuscular system impairment

7. Any systemic arthritic condition

Measurement tools:

i. Smartphone application- Physio Master: Physical Therapy(version2.1.1)

ii. Universal goniometer

iii. Stabilizing straps

Physio Master: Physical Therapy (Version2.1.1) is smartphone application which can be used for Posture analysis, Accurate goniometer for Range of Motion (ROM) measurement, Angles and

ROM measurements on images, Functional Movement Screen (FMS) analysis Motion analysis (angles, velocities, accelerations),10-meter walk test, 6-minute walk test. The three axes linear accelerometers built into this software are used to measure the pull of gravity. For this, regardless of orientation, the gyroscope maintains a fixed position. When an object is set up against a solid surface, the software makes use of the smartphone's built-in magnetometer to determine the device's orientation in relation to the Earth's magnetic field by leveraging the Hall effect. We will be use this application to measure the range of motion of shoulder joint as there is no available literature on the reliability and validity of this application for individuals with and without shoulder pain.

Protocol and procedure:

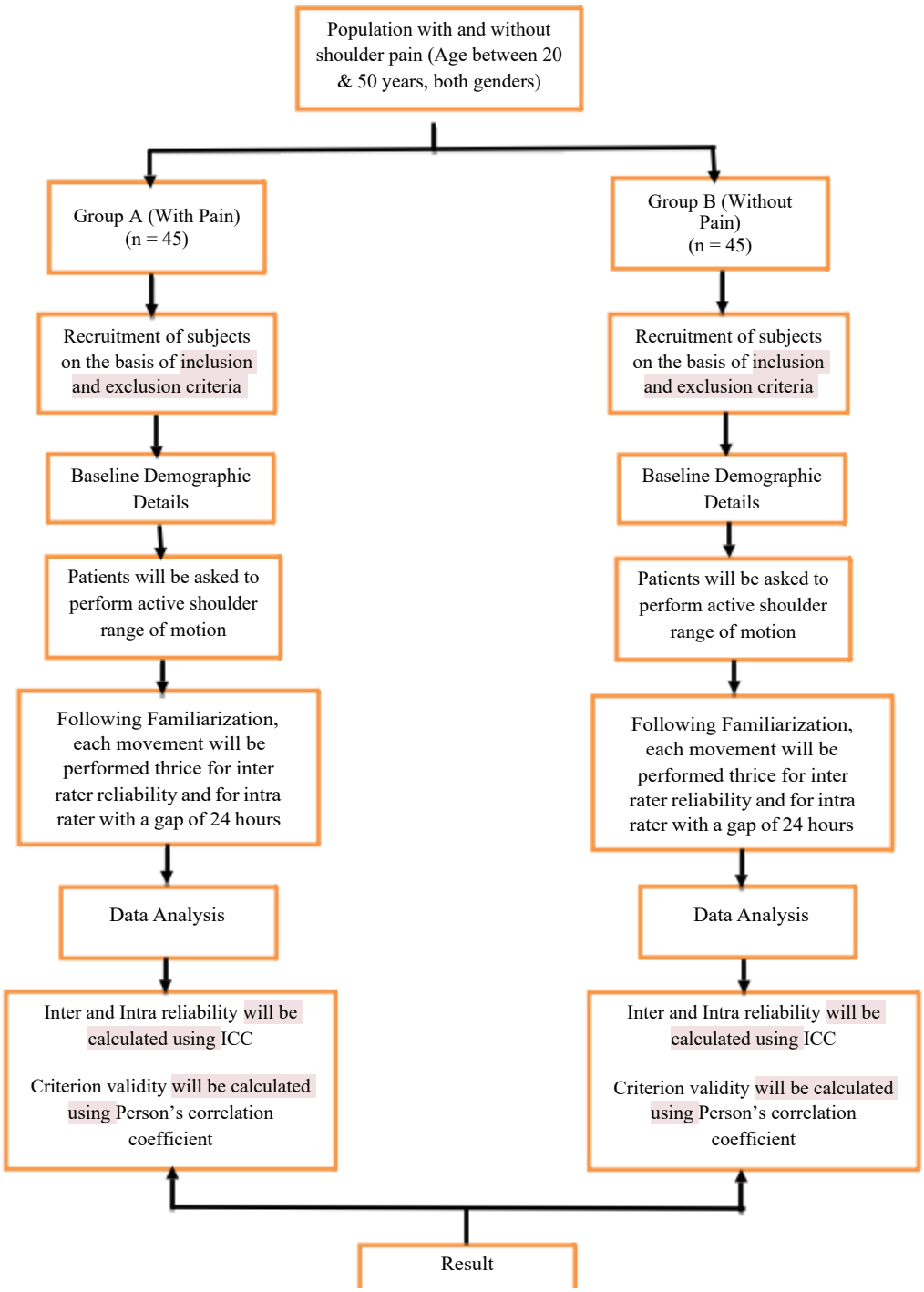
Before the commencement of the study appropriate ethical clearance will be taken from the ethical committee. The subjects will recruit from the Physiotherapy OPD department, Subharti University, Meerut on the basis of inclusion and exclusion criteria. Subjects will berequired to sign the consent form explaining their rights as research subjects. All the identifying information on the consent form and demographic data shall be kept confidential.

The initial assessment of the subjects included demographic data, anthropometric characteristics, and screening for shoulder joint, following which the patients performed active range of motion. Following familiarization, each movement ill performed thrice. The mean of the three measurements for each movement will be use for analysis. Subjects completed the movements in the same standardized order during all testing sessions. For intra-rater reliability, all tests will re-administer within 24 hours.

Procedure

Subjects will recruit from the Physiotherapy OPD department, Subharti University, Meerut

based on inclusion and exclusion criteria. All subjects signed the consent form explaining their rights as research subjects. After the initial assessment, patients will ask to perform the active range of motion at shoulder joint. All the subjects will be informed about the duration, situation, and method before the measurement


Population with and without shoulder pain (Age between 20 & 50 years, both genders)
Group A (With Pain) (n = 45)
Group B (Without Pain) (n = 45)
Recruitment of subjects on the basis of inclusion and exclusion criteria
Recruitment of subjects on the basis of inclusion and exclusion criteria
Baseline Demographic Details
Baseline Demographic Details
Patients will be asked to perform active shoulder range of motion
Patients will be asked to perform active shoulder range of motion
Following Familiarization, each movement will be performed thrice for inter rater reliability and for intra rater with a gap of 24 hours
Following Familiarization, each movement will be performed thrice for inter rater reliability and for intra rater with a gap of 24 hours
Data Analysis
Data Analysis
Inter and Intra reliability will be calculated using ICC
Criterion validity will be calculated using Person's correlation coefficient
Inter and Intra reliability will be calculated using ICC
Criterion validity will be calculated using Person's correlation coefficient
Result

Clinical procedures

All Participants warmed up themselves with five repetitions of each movement and then all measures will be performed thrice Shoulder movements will measured in following movements: flexion, extension, abduction, external rotation, and internal rotation. Flexion, extension, and abduction will be performed in standing position and internal and external rotation in supine position.

Table 1 Normal range of motion of shoulder joint

Movements	**Normal Range of motion**
Flexion	0-180°
Extension	0-60°
Abduction	0-180°
External rotation	0-90°
Internal rotation	0-90°

Placement of smartphone application: Smartphone attached to the distal portion of humerus of participants for standing measurements and for rotation measurements shoulder position at 90° abduction, 90° elbow flexion, and forearm at neutral position, armband attached below elbow for rotation measurements in supine position.

Placement of universal goniometer – two arm stainless steel goniometer

Table 2 Placement of universal goniometer

Movements	Axis location	Stationary arm	Movement arm
Flexion/extension	Humeral head laterally	Parallel with the trunk	Midline of the humerus (lateral epicondyle)
Abduction	Inferior lateral coracoid process	Parallel with the trunk	Midline of the humerus
External/internal rotation	Olecranon process of the ulna	Perpendicular to the floor	In line with the ulnar styloid process

Selection of examiners for the inter rater and intra rater reliability study

Four students in physical therapy received three hours of training to adequately manipulate the goniometer application. Following their training session, they determined which anatomical point of reference should be used with the application and they practiced for an hour to make sure, their method is standardized. They then measured their own ROM with the universal goniometer and the goniometer application (each student measured twice). The intra-rater reliability will calculated for each student with the intraclass correlation coefficient (ICC). The three students with higher ICC's results will assigned as examiners for the reliability part ofthe study. These three students practiced their techniques in another two-hour session with four volunteers to standardize the procedure. This had been done in order to minimize the error originating from examiners.

Selection of the examiner for the criterion validity study

Between the three examiners, the one with the highest intra-rater reliability (highest ICCs) will assigned to undertake the validity study. This had been done in order to minimize the error originating from examiners.

Procedures for the inter rater and intra rater reliability study

Three examiners entered three different rooms with a paired observer. They took all shoulder active ROM measures (flexion, extension, abduction, adduction, external and internal rotations) with the goniometer application while their paired observer noted down the measures. Then examiners changed the room in a clockwise motion until they take three measures of each movement for each participant with the goniometer application. This allowed us to measure both intra and inter-rater reliability.

Procedures for the criterion validity study

Examiner with the highest intra-rater ICCs during the selection of examiners process entered room 1 with his paired observer. He measured active shoulder ROM measures (flexion, extension, abduction, adduction, medial and lateral rotations) with the universal goniometer. The examiner then changed the room in clockwise motion until he took measurement of each movement for each participant with the universal goniometer this allowed us to establish the criterion validity of the smartphone application in comparison to this gold standard.

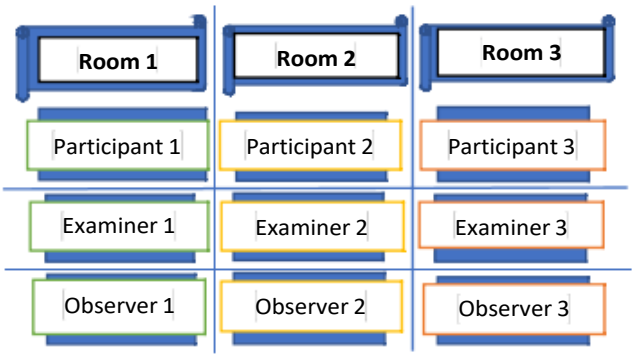


Figure 1 Data collection procedures

ICC values were interpretated as follows: <0.5 = poor reliability; 0.5–0.75 = moderate reliability; 0.75–0.90 = good reliability; >0.90 = very good reliability

ICC less than 0.5 indicates poor validity, 0.5 to 0.65 indicate moderate to good validity, andan ICC value of greater than 0.65 shows good validity.

Data analysis:

There will be 90 participants, 45 with and 45 without shoulder pain in the study. For the general characteristics of the participants (i.e., age, gender, height, weight, BMI), descriptive statistics will be use. Means (± SD) was calculated for continuous data. A Kolmograph–Smirnov (K–S) test was performed to determine the normal distribution of each variable. An independent t - test and chi square will use to compare between the participants with shoulder pain and without shoulder pain. The Interclass Correlation Coefficient (ICC) calculation will use witha 95% CI. Based on the 95 % CI of the ICC, the reliability values were classified as excellent (ICC ≥ 0.9); good (ICC 0.75–0.89); fair (ICC 0.5– 0.75); and poor (ICC < 0.5) 0.90–0.99 for higher reliability, 0.80–0.89 for good reliability, 0.70–0.79 for fair reliability, and 0.69 and below for poor reliability. The Interclass Correlation Coefficient (ICC) calculation will be use

with a 95% CI accompanied by the standard error of the mean (SEM) SEM = SD √ (1 – ICC) (90). These measurements will accompany by the minimum detectable change (MDC) with the formula MDC = 1.96 √ 2 SEM (91). All statistical analyses will perform using SPSS 16.0 statistical software (SPSS, Chicago, IL, USA).

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Annexure

PATIENT CONSENT FORM

DEPARTMENT OF PHYSIOTHERAPY

CONSENT FORM

S.NO.	Date: -
Name: -	Age/ Gender: -
Fathers/Husbands Name: -	

The details of the study entitled "**Evaluation of clinimetric properties of a Smartphone Application: Quantifying Shoulder Active range of motion in subjects with and without shoulder mobility deficits**" have been explained to me in my language and

1. I understand the purpose of the study and I have right to withdraw from the study at any point in time during the investigation. I can decline to answer to any particular question if it offends my privacy in any form without losing the right to be treated.
2. I understand that my participation in this study will be kept confidential and is primarily meant for research and for the benefits for the society.
3. I give for consent for my details to be used in this study. I understand that on completion of the study, if I withdraw from the study, my personal report form will be destroyed. I also understand that if there is any problem with any of the examination test or measurement taken, I will be informed and the report will be kept confidential.
4. The risk factors like increase in pain, chance of swelling and redness have been explained to me.
5. I do hereby give my consent voluntarily without any inducement, to take part in this study and I have no objection to the use of data in my publication.

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Signature of Patient Signature of Investigator/Practitioner

For further information, please contact

…….
Department of Physiotherapy
Subharti University,
Meerut Contact no: ……..

PATIENT INFORMATION SHEET

Name		Height(cm)	
Age		Weight(kg)	
Gender		BMI (kg/m2)	
Contact no.		Date	

Medical history:

1. Medications: Yes/No
2. Have you had any surgeries or suffered from injuries to upper extremities in the 12months prior to the study? Yes/No
3. Have you been diagnosed with any cardiovascular or neurological disorders? Yes/No
4. Have you been diagnosed with a vestibular or neuromuscular disorder? Yes/No
5. Have you received any intra-articular injections in the last 90 days? Yes/No
6. Have you had any other associated shoulder, arm, forearm and wrist disorders? Yes/No
7. Have you been diagnosed with any systemic arthritic condition? Yes/No
8. Are you able to walk independently in your house? Yes/No
9. Do you have complaints/problems with hearing? Yes/No
10. Do you have complaints/problems with vision? Yes/No

DATA COLLECTION FORM

Name		Weight	
Age		Height	
Gender		BMI	
Affected side		Occupation	
Dominant side		Date	
NPRS		Address	

For reliability study:

Variable	1st Measurement	2nd Measurement	3rd Measurement
Flexion			
Extension			
Abduction			
External rotation			
Internal rotation			

For criterion validity:

Variables	Measurement
Flexion	
Extension	
Abduction	
External rotation	
Internal rotation	